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813,998

SHEET

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.

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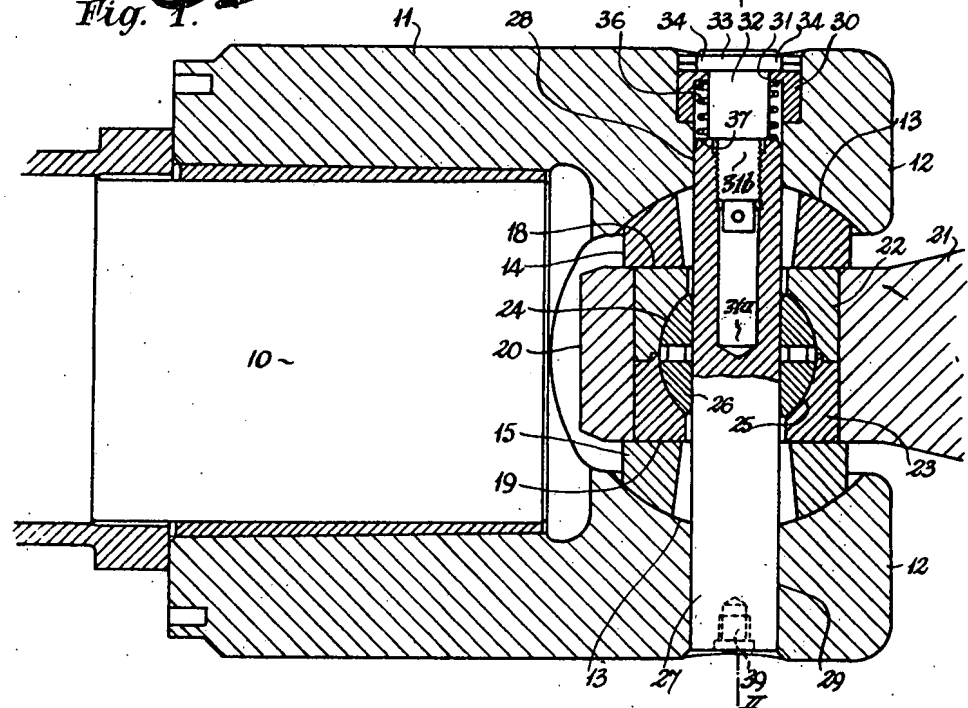


Fig. 2.

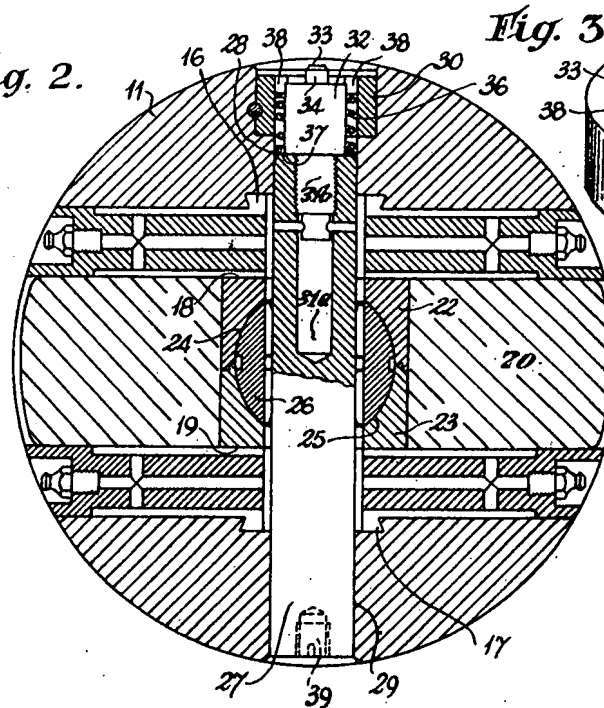
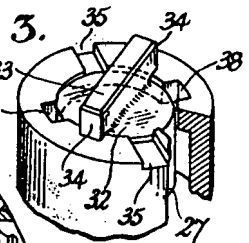


Fig. 3.



## PATENT SPECIFICATION

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## COMPLETE SPECIFICATION.

## Improvements in Universal Couplings.

We, THE BRIGHTSIDE FOUNDRY & ENGINEERING COMPANY LIMITED, a British Company, of Ecclesfield, Sheffield, and GEOFFREY HURT, a British Subject, of the Company's address, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to universal couplings.

Where rotary motion is transmitted between a driven and a driving member whose respective axial locations may vary the one relative to the other at regular or irregular intervals, a universal form of transmission of rotary power must be used.

Many forms of universal couplings are known and have been used which generally comprise a coupling head having a pair of couplings jaws containing two swivelling elements of anti-friction material in the form of segments of cylinders retained in engagement with cylindrical surfaces of the coupling jaws by bolts, pins, cotters, screws or the like. The opposing inner faces of the swivelling elements are parallel plane faces engaged by the remote plane faces of the palm end of a universal spindle which fits between said swivelling elements and which itself contains a bush or hollow spherical block of anti-friction material through which the securing bolt, pin or other securing member passes, the whole assembly allowing freedom of motion of the universal spindle through a predetermined but adjustable angle with respect to the axis of the driving and driven members.

Where such couplings are used under conditions which it is not necessary for them to be dismantled at frequent intervals, it is customary to use a construction of coupling which may require a considerable time for dismantling and re-assembly. This

is relatively unimportant when such universal couplings have to be taken apart at infrequent intervals for maintenance purposes or the like, but in certain machines, for example, rolling mills for hot or cold working of ferrous and non-ferrous metals, it is common experience that such couplings have to be dismantled and re-assembled frequently, for instance, when changing rolls. Such dismantling and re-assembling often renders a rolling mill inoperative for much longer periods than is desirable and the object of this invention is to provide a universal coupling which can be dismantled and re-assembled with a minimum loss of time.

According to this invention a universal coupling which comprises a coupling head on either a rotary driven or driving member, a pair of jaws on said head having opposing cylindrical bearing surfaces, a pair of swivelling elements retained in swivelling engagement with said jaw surfaces and swivelably accommodating between them the spade or palm end of a spindle of the driving or driven member containing a bearing bush or hollow block at the axis of the jaw surfaces, and a securing pin extending through said jaw, the swivelling elements, the spade or palm end and the bearing bush or block centrally of the latter and being secured to the jaws in driving connection therewith for swivelably retaining the coupled parts together, is characterised by the provision of co-operating means on one end of the securing pin and in one of the coupling jaws for detachably holding the securing pin in position in coaxial pin-receiving bores in the coupling jaws.

The co-operating means comprises optional lug and slot engagements which are adapted to obtain between one end of the securing pin and a locking member therefor removably fitted in the bore of one

of the coupling jaws, there being one or more axial slots provided in said locking member for slidable engagement therethrough of one or more lugs projecting radially from the end of the securing pin thereby to permit of insertion and withdrawal of said pin axially into and from the pin-receiving bores in the coupling jaws and one or more radial slots in said locking member, angularly displaced with respect to the axial slot or slots, for retentive engagement therein of the said lug or lugs on said securing pin end, spring means being provided for applying opposing thrust to the locking member and the securing pin, and that end of the securing pin accommodated in the bore of the other coupling jaw being adapted for the attachment of an extraneous tool or provided with means manipulable for insertion and withdrawal of the securing pin into and out of position.

The lug or lugs on the end of the securing pin may be the projecting end or ends of a diametral rib or integral cross-bar on the end face of a reduced end length of the securing pin or the projecting ends of a separate cross-bar extending through and secured in a diametral hole near the outer end of said reduced end length of the securing pin.

The overall diameter of the reduced end of the securing pin and lug or lugs is such that it is not greater than the normal diameter of the securing pin.

The securing pin is of a construction such that when in position the length thereof from the longitudinal axis of the coupling head to the withdrawal end of the securing pin is heavier than the remaining length.

The locking member for the securing pin comprises a ring having at one end an inwardly extending radial flange, said ring being detachably secured in an outer enlargement of the pin-receiving bore of one of the coupling jaws with flanged end of said ring outermost and the normal bore thereof coincident with the smaller diameter of the bore of the coupling jaw.

The flanged end of the locking ring is provided with a radial slot or slots extending throughout the thickness of the ring and flange and for part only of the depth thereof, said slot or slots being adapted to accommodate the lug or lugs on the locking pin end so that the basal walls of said slot or slots form seatings for the lug or lugs and thereby support said pin.

Also provided on the flanged end of the locking ring but in the flange only thereof is an axial slot or slots which extend throughout the depth of the flange, said slot or slots, however, being angularly displaced with respect to the radial slot or slots and being adapted, when engaged by the lug or lugs on the locking pin end, to permit of

slidable passage therethrough of said lug or lugs.

Since the normal diameter of the securing pin is such as to permit of its entry into the normal bore of the coupling jaws for receiving said pin and since the overall diameter of the lug or lugs on the reduced end of the securing pin is not greater than that of the securing pin, said pin is capable of entry into the pin-receiving bores of the coupling jaws.

For inserting the securing pin into position, therefore, it is inserted, reduced end foremost, into the bore of one coupling jaw and then into the bore of the other coupling jaw containing the securing pin-locking member or ring so that the lug or lugs on the pin pass completely through the axial slot or slots in the flange only of said ring whereupon the securing pin is rotated the necessary number of degrees to bring the lug or lugs in register with the radial slot or slots, the securing pin is then retracted axially sufficiently to bring the lug or lugs thereon into engagement with the radial slot or slots whereby the securing pin is prevented from being withdrawn.

For locking the securing pin in position, a coil spring surrounds the reduced length thereof between it and the inner circumferential wall of the locking ring, one end of said spring bearing against the inner radial face of the flange of said locking ring and the other end bearing against a shoulder formed on the securing pin at the junction of the reduced length thereof with the normal diameter of the pin.

For convenience, the reduced length of the securing pin having the lug or lugs may be a separately attached length having a screw threaded stem by which it is connected to the remaining length of the securing pin which is of normal diameter.

The accompanying drawings are illustrative of a typical embodiment of the invention as applied to a universal coupling for a rolling mill.

In the drawings:—

Fig. 1 is a sectional elevation showing the universal coupling connecting a driving spindle to a roll.

Fig. 2 is a cross-section on the line II—II of Fig. 1.

Fig. 3 is a fragmentary perspective view diagrammatically illustrating a mode of assembly of the securing pin into position.

The numeral 10 indicates a driven roll on one end of which is mounted a coupling head 11 having a pair of coupling jaws 12 whose diametrically opposing faces 13 form like parts of a cylinder spaced apart on an axis at right angles to the axis of the roll.

In engagement with the opposing jaw faces are two swivelling elements 14, 15 which form two segments of a cylinder and

which can rotate about the axis of the jaw faces a predetermined amount controlled only by design limitations, said swivelling elements 14, 15 being retained within the jaws by a dovetail enclosure 16, 17.

The opposing faces 18, 19 of the swivelling elements are substantially plane faces in parallel relation to each other and interposed between them and in engagement therewith is the orificed spade or palm end 20 of a spindle 21 for transmitting drive to the driven roll 10 through the coupling head 11 thereof, said spindle being freely swivelable with respect to the axis of the jaws and also on an axis at right angles thereto which, combined with the swivelable movement of the swivelling elements 14, 15, provides a universal drive, that is to say, the longitudinal axis of the driving spindle can be displaced relative to the longitudinal axis of the roll.

The spade or palm end 20 of the spindle 21 is retained in position by having in its orifice two mutually interengaged cylindrical anti-friction or other elements 22, 23 whose inner surfaces 24, 25 are of spherical formation providing a seating for a hollow spherical member 26 which is of an anti-friction material where the cylindrical elements 22, 23 themselves are not of such material, a securing pin 27 passing through said hollow spherical member at right angles to the axis of the jaw faces 13 with its ends entered one each into pin-receiving holes 28, 29 in said jaws. The outer length of the pin-receiving hole 28 in one jaw 12 is enlarged in diameter and accommodates a flanged locking ring 30 of which the normal internal diameter is equivalent to that of the normal or lesser diameter of the pin-receiving hole 28 except for an inwardly extending radial flange 31 at the outer end of the ring.

One end length of the securing pin 27 is hollow as seen at 31a and its orifice screw threaded interiorly and engaged by the complementary threaded reduced shank 31b of a stem 32 which forms a reduced extension of said pin 27 extending through the bore of the flange 31 of the locking ring 30, the protruding extremity of the stem 32 being in the form of a diametral rib 33 which provides a pair of diametrically opposite integral lugs 34 projecting radially from the stem 32 of said pin, said lugs engaging complementary radial slots 35 (Fig. 3) in the flanged end of the ring.

Around the stem 32 of the securing pin 27 between it and the normal bore of the locking ring 30 is a coil spring 36 one end of which bears against the underside of the flange 31 of said ring while the other end bears against an annular shoulder 37 on the securing pin 27 whereby axial thrust is imposed on the securing pin so as to retain

the lugs 34 thereon in engagement with the slots 35 in the ring.

Additional slots 38 (Fig. 3) are provided in the ring but only in the flange 31 axially thereof and at a displacement of 90° with respect to the radial slots 35, said axial slots 38 being provided for the purpose of admitting passage of the lugs 34 of the stem 32 of the pin 27 when said pin has been rotated 90° from the position in which the lugs are seated in the radial slots 35. Such provision for passage of the lugs on the stem of the pin enables insertion and withdrawal of the pin into and out of its position in the coupling head.

The other end of the securing pin 27 is provided with a screw threaded socket 39 for engagement by an extraneous tool which, when screwed into said socket, is manipulable for withdrawing the pin as required.

The provision of the hollow length at the locking end of the securing pin renders that length from the longitudinal axis of the coupling head to the withdrawal end of said pin heavier than the remaining length thereof which prevents axial displacement of the pin.

With a universal coupling according to this invention, therefore, a single securing pin only is employed which is capable of being rapidly inserted into and removed from its position and which is self-locking when in position, thus facilitating rapid removal of the driving or driven unit together with the coupling head, and removal and replacing of the attached parts with a minimum of loss of time.

#### WHAT WE CLAIM IS:—

1. A universal coupling comprising a coupling head on either a rotary driven or driving member, a pair of jaws on said head having opposing cylindrical bearing surfaces, a pair of swivelling elements retained in swivelling engagement with said jaw surfaces and swivelably accommodating between them the spade or palm end of a spindle of the driving or driven member containing a bearing bush or hollow block at the axis of the jaw surfaces, and a securing pin extending through said jaws, the swivelling elements, the spade or palm end and the bearing bush or block centrally of the latter and being secured to the jaws in driving connection therewith for swivelably retaining the coupled parts together, characterised by the provision of co-operating means on one end of the securing pin and in one of the coupling jaws for detachably holding the securing pin in position in co-axial pin-receiving bores in the coupling jaws.

2. A universal coupling according to Claim 1, wherein the securing pin is self-locking at one end thereof, when in posi-

tion in the securing pin-receiving bores of the coupling jaws by one or more radially projecting lugs on the extremity of a reduced end length of said securing pin engaging a complementary radial slot or slots in a locking ring fitted in the pin-receiving bore of one of said jaws and by a coil spring around said reduced length of said pin applying opposing axial thrust to the locking ring and the securing pin, said securing pin being readily removable by manually applying axial displacement thereto to an extent sufficient to overcome the thrust of the spring and to disengage the lug or lugs from the radial slot or slots and then rotating said securing pin to register with axial slot or slots in the locking ring and axially withdrawing the securing pin.

3. A universal coupling according to Claim 1 wherein an attached radially flanged locking ring is made fast within an enlarged end of the securing pin-receiving bore of one of the coupling jaws and accommodates an end of the securing pin with radial lug and slot engagement obtaining between the flange of said locking ring and said securing pin end, a coil spring disposed around the pin end and within the locking ring and bearing against said flange and a shoulder on the securing pin yieldingly retaining the securing pin in locked position in the jaws of the coupling head, the flange of said locking ring being provided with one or more axial slots, angularly displaced with respect to the radial slot or slots, permitting passage therethrough of the lug or lugs of the securing pin when inserting and removing said securing pin into and from position in the coupling jaws.

4. A universal coupling according to any

preceding claim, wherein that length of the securing pin remote from the locking end thereof and extending from the longitudinal axis of the coupling head is heavier than the remaining length.

5. A universal coupling according to any preceding claim, wherein the self-locking end of the securing pin is constituted by a member of reduced diameter thereto.

6. A universal coupling according to any preceding claim, wherein the lug or lugs on the end of the securing pin is or are the projecting end or ends of a diametral rib or integral cross-bar on the end face of a member of reduced diameter attached to said pin.

7. A universal coupling according to any preceding claim, wherein the lug or lugs on the end of the securing pin is or are the projecting end or ends of a separate cross-bar extending through and secured in a diametral hole near the outer end of a member of reduced diameter attached to said pin.

8. A universal coupling according to any preceding claim, wherein the overall diameter of the lug or lugs is such that it is not greater than the normal diameter of the securing pin.

9. A universal coupling constructed; arranged and adapted to operate substantially as described with reference to the accompanying drawings.

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## PROVISIONAL SPECIFICATION.

### Improvements in Universal Couplings.

We, THE BRIGHTSIDE FOUNDRY & ENGINEERING COMPANY LIMITED, a British Company, of Ecclesfield, Sheffield, and GEOFFREY HURT, a British Subject, of the Company's address, do hereby declare this invention to be described in the following statement:—

This invention relates to universal couplings.

Where rotary motion is transmitted between a driven and a driving member whose respective axial locations may vary the one relative to the other at regular or irregular intervals, a universal form of transmission of rotary power must be used.

Many forms of universal couplings are known and have been used which generally comprise a coupling head having a pair of couplings jaws containing two swivelling

elements of anti-friction material in the form of segments of cylinders or spheres retained in engagement with cylindrical or spherical surfaces of the coupling jaws by bolts, pins, cotters, screws or the like. The opposing inner faces of the swivelling elements are parallel plane faces engaged by the remote plane faces of the palm end of a universal spindle which fits between said swivelling elements and which itself contains a bush or hollow spherical block of anti-friction material through which the securing bolt, pin or other securing member passes, the whole assembly allowing freedom of motion of the universal spindle through a predetermined but adjustable angle with respect to the axis of the driving and driven members.

Where such couplings are used under conditions which it is not necessary for them to be dismantled at frequent intervals, it is customary to use a construction of coupling which may require a considerable time for dismantling and re-assembly. This is relatively unimportant when such universal couplings have to be taken apart at infrequent intervals for maintenance purposes or the like, but in certain machines, for example, rolling mills for hot or cold working of ferrous and non-ferrous metals, it is common experience that such couplings have to be dismantled and re-assembled several times per day, for instance, when changing rolls. Such dismantling and re-assembling often renders a rolling mill in-operative for much longer periods than is desirable and the object of this invention is to provide a universal coupling which can be dismantled and re-assembled with a minimum loss of time.

According to this invention a universal coupling which comprises a coupling head on either a rotary driven or driving member, a pair of jaws on said head having opposing cylindrical or spherical bearing surfaces, a pair of swivelling elements retained in swivelling engagement with said jaw surfaces and swivelably accommodating between them the spade or palm end of a universal spindle of the driving or driven member containing a bearing bush or hollow block at the axis or centre of the jaw surfaces, and a securing pin extending through said jaws, the swivelling elements, the spade or palm end and the bearing bush or block centrally of the latter and being secured to the jaws in driving connection therewith for swivelably retaining the coupled parts together, is characterised by the provision of co-operating means on one end of the securing pin and in one of the coupling jaws for detachably holding the securing pin in position in coaxial pin-receiving bores in the coupling jaws.

The co-operating means comprises separate pairs of optional lug and slot engagements which are adapted to obtain between one end of the securing pin and a locking member therefor removably fitted in the bore of one of the coupling jaws, there being one pair of diametral slots provided in said locking member for slidable engagement therethrough of a pair of diametral lugs projecting radially from the end of the securing pin thereby to permit of insertion and withdrawal of said pin axially into and from the pin-receiving bores in the coupling jaws and another pair of diametral slots in said locking member, angularly displaced with respect to said one pair of slots, for retentive engagement therein of the said lugs on said securing pin end, spring means being provided for applying opposing thrust to the

locking member and the securing pin, and that end of the securing pin accommodated in the bore of the other coupling jaw being adapted for the attachment of an extraneous tool or provided with means manipulable for insertion and withdrawal of the securing pin into and out of position.

The lugs on the end of the securing pin may be the projecting ends of a diametral rib or integral cross-bar on the end face of a reduced end length of the securing pin.

Alternatively, they may be the projecting ends of a separate cross-bar extending through and secured in a diametral hole near the outer end of a reduced end length of the securing pin.

The overall diameter of the lugs is such that it is not greater than the normal diameter of the securing pin.

The securing pin is of a construction such that when in position the length thereof from the longitudinal axis of the coupling head to the withdrawal end of the securing pin is heavier than the remaining length.

The locking member for the securing pin comprises a ring having at one end an inwardly extending radial flange, said ring being detachably secured in an outer enlargement of the pin-receiving bore of one of the coupling jaws with the flanged end of said ring outermost and the normal bore thereof coincident with the smaller diameter of the bore of the coupling jaw.

The flanged end of the locking ring is provided with a pair of diametral slots extending radially throughout the width of the ring and flange thereof, said slots being adapted to accommodate the diametral lugs on the locking pin end so that the basal walls of said slots thereby support said pin.

Also provided in the flanged end of the locking pin but in the flange only thereof is another pair of diametral slots which extend throughout the depth of the flange, these said slots, however, being angularly displaced 90° with respect to the other slots and being adapted, when engaged by the lugs on the locking pin end, to permit of slidable passage therethrough of said lugs.

Since the normal diameter of the securing pin is such as to permit of its entry into the normal bore of the coupling jaws for receiving said pin and since the overall diameter of the lugs on the reduced end of the securing pin is not greater than that of the securing pin, said pin is capable of entry into the pin-receiving bores of the coupling jaws.

For inserting the securing pin into position, therefore, it is inserted, reduced end foremost, into the bore of one coupling jaw and then into the bore of the other coupling jaw containing the securing pin-locking member or ring so that the lugs on the pin pass completely through the one pair

of slots in the flange only of said ring whereupon the securing pin is rotated through 90° to bring the lugs in register with the other pair of slots, the securing pin is then retracted axially sufficiently to bring the lugs thereon into engagement with said other pair of slots whereby the securing pin is prevented from being withdrawn.

For locking the securing pin in position, a coil spring surrounds the reduced length thereof between it and the inner circumferential wall of the locking ring, said spring bearing against the inner radial face of the flange of said locking ring and a shoulder formed on the securing pin at the junction of the reduced length thereof with the normal diameter of the pin.

For convenience, the reduced length of the securing pin having the lugs may be a separately attached length having a screw threaded stem by which it is connected to the remain of the securing pin which is of normal diameter.

A typical embodiment of the invention as applied to a universal coupling for a rolling mill comprises a driven roll at one end of which is mounted a coupling head having a pair of coupling jaws whose opposing faces form like parts of a cylinder spaced apart on an axis at right angles to the axis of the roll. In engagement with the opposing jaw faces is a pair of swivelling elements which form two segments of a cylinder and which can rotate about the axis of the jaw faces a predetermined amount controlled only by design limitations, said swivelling elements being retained within the jaws by a dovetail enclosure.

The opposing faces of the swivelling elements are substantially plane faces in parallel relation to each other and interposed between them and in engagement therewith is the orificed spade or palm end of a universal spindle for transmitting drive to the driven roll through the coupling head thereof, said universal spindle being freely swivelable with respect to the axis of the jaws and also on an axis at right angles thereto which combined with the swivelable movement of the swivelling elements, provides a universal drive, that is to say, the longitudinal axis of the universal spindle can be displaced relative to the longitudinal axis of the roll.

The spade or palm end of the universal spindle is retained in position by having in its orifice two semi-cylindrical anti-friction elements whose inner surfaces are of spherical formation providing a seating for

a hollow spherical member, a securing pin passing through said hollow spherical member at right angles to the axis of the jaw faces with its ends entered into pin-receiving holes in said jaws. The outer length of the holes in one jaw is enlarged in diameter and accommodates a locking ring of which the internal diameter is equivalent to that of the normal or less diameter of the pin-receiving hole except for an inwardly extending radial flange at the outer end of the ring.

The end length of one end of the securing pin is of reduced diameter such that it extends through the bore of the flange of the locking ring, the protruding extremity of the securing pin being in the form of a diametral rib which provides a pair of diametrically opposite lugs projecting radially from the reduced end of said pin, said lugs engaging complementary radial slots in the flanged end of the ring.

Around the reduced length of the securing pin between it and the normal bore of the ring is a coil spring which bears in a direction inwardly of the ring against an annular shoulder on the securing pin and the inner face of the flange of the ring whereby axial thrust is imposed on the securing pin so as to retain the lugs thereon in engagement with the slots in the ring and flange thereof.

Additional slots are provided axially in the ring but only in the flange thereof and at a displacement of 90° with respect to the first mentioned slots, said axial slots being provided for the purpose admitting passage of the lugs of the pin when said pin has been rotated 90° from the position in which its lugs are seated in the radial slots. Such provision for passage of the lugs on the pin enables insertion and withdrawal of the pin into and out of its position in the coupling head.

The other end of the pin is provided with a screw threaded socket for engagement by an extraneous tool which when screwed into said socket is manipulable for withdrawing the pin as required.

A universal coupling according to this invention provides for rapid removal of the driven unit together with the coupling head and its attached parts can be removed and replaced with a minimum loss of time.

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